European Water Association

25 YEARS
EWA
1981-2006

A PRELIMINARY OPINION OF THE EUROPEAN WATER ASSOCIATION (EWA) ON THE SUBJECT OF THE CONSEQUENCES OF CLIMATE CHANGE FOR WATER MANAGEMENT

SUMMARY

S1 This Opinion is not intended to be a definitive analysis of the consequences of the present and predicted changes in weather for water management. It is offering some thoughts as a scene setter for further work. Even in the EWA there is not yet a consensus of views on the impact of climate change on water management, but the association brings together a very wide range of professionals who are members of the national Member Associations (see annex I). The EWA offers the European Commission access to this industry expertise as part of its pursuit to find the right courses of action for the future. This opinion is intended to be a working document that will undergo many revisions during the development of climate change policy within the EU.

S2 The EWA recognises that climate change will lead to increased droughts, floods due in part to more intense rainfall, heat waves and other ecological disturbances as well as impact on water resources across Europe. This will raise questions about the resilience of infrastructure and how vulnerable it is such events and it will also require a review of policy to determine if climate change effects are being fully accounted for.

S3 From the evidence available it is clear that climate risk factors now have to be built into water cycle management and it is important that funds should be available to support the practical consequences of this. The EWA recognises the breadth and complexity of the topic and the importance of understanding what the resultant risks of climate change are for the water sector. Only when the issues are fully understood can investment be properly geared towards the risks.

S4 The EWA believes that climate change factors need to be incorporated into the design of sewerage systems; climate change risk factors need to more widely used in flood risk management; water resource planning must incorporate the social and economic impacts of climate change in addition the resource implications and the EU needs to ensure that climate change is incorporated into directives and other legislation.

S5 Every three years the EWA organises a major conference at the IFAT in Munich and the next one is in April 2008. The EWA intends that the topic of climate change will be included in the conference. It intends that the co-organisers will be the Water Environment Federation of the US and the Japan Sewerage Works Association (JWSA). It will also draw on information developed through national work and conferences organised by National Members. Hence the EWA offers to harmonise its work programme with that of the Commission and the German Presidency.

INTRODUCTION

1 The EWA represents approximately 55000 individual professionals, principally working in the European Union countries but also including a number of non member states from the Balkans, the Baltics and countries such as the Ukraine. They work in all aspects of water cycle management and include engineers, scientists, economists, planners, meteorologists and so on. The individuals work in utilities, government

agencies, environmental regulators, Universities, consultancies, specialist research & training organisations and many other kinds of employment.

2 The EWA is mindful of the growing interest by the public in the subject of climate change and the debates surrounding the issue. It supports the work being planned by the commission on this topic and will assist the German Presidency with its focus on this subject. The EWA is well placed to contribute with practical insights and can help to shape the European Union's responses to cope with future needs.

3 The intention of this note is to provide an outline view on the consequences of the changes and what can be done to adapt to them.

WHAT ARE THE LIKELY CHANGES IN CLIMATE

4 There is now consensus that the climate is changing, it is the extent of change that is the subject of debate and there are many models that describe the impact of climate change. The difficulties that investors, utility plant designers, operators, local authority drainage managers, local municipal planners and others have to face is how much climate change will affect them and how quickly they must make plans to adapt to the effects. In many cases it will be necessary to make investment in advance of major problems developing, on the basis of model predictions – such as in flood risk management. However, there will need to be consensus and as a starting point for developing this in Europe it seems reasonable to begin with the assumptions that average temperatures may well continue to rise and this will change the frequency and intensity of rainfall patterns throughout the European region. The light and frequent summer rainfall of North West Europe could become more like the intense thunderstorms of Southern Europe so extreme metrological events are likely to become more common place and this will also affect local micro-climates. Extended periods of drought are likely to occur in southern Europe which may face increased risk of desertification. These changes have to be taken into account for managing water resources and ecosystems, for managing water uses and for designing and managing water related assets.

THE CONSEQUENCES OF CHANGES IN TEMPERATURE

Water Consumption

5 There is a need to establish if and how average per capita consumption will change across Europe, though each country has different patterns of usage and different population demographics. However, it is reasonable for regions within the European Union to pose the question about the changes in water consumption accepting that the answers may well be different country to country. It also makes sense to ask the question, when designing water and wastewater treatment systems, drainage networks etc. whether or not there will be a need to include a climate change factor for design horizons. Modern design concepts should include a risk matrix that reflects the potential impacts of climate change. Equally water resources planners and waste water treatment planners must account for increases in water consumption.

Evapotranspiration and irrigation

6 If there are higher temperatures there will be more evapotranspiration and this could push up water demand by agriculture. Crops will need to be watered and irrigated differently depending on how rainfall changes at the same time and there will be changes in the crops grown as agriculture adapts to climatic change. Water resources planners must take this into account from now on. Irrigation techniques and practices must evolve, for example using drip feed which is less wasteful than spraying. There are many other matters which could arise from this and crop geneticists must predict whether or not more temperature resistant varieties used currently in hotter climates will flourish equally well in the warming temperate climes.

Prudence in use

7 Higher temperatures will inevitably lead to greater demand for water. This will cause extra stresses on water resources. The EWA considers it prudent to plan on the basis that in areas of risk of climate change

the social and even the economic values of water to all consumers will rise. Customers should be encouraged to use water wisely all the time not just when droughts occur. The water rich areas with a high risk of climate change must learn the habits of the water scarce areas. The economic levels of leakage from water distribution systems will inevitably change and the economic models used to determine the lower levels must now include a climate change risk factor

Reticulation and Treatment

8 Higher temperatures should aid the efficiency of biological processes used in water treatment, particularly for waste water treatment. It may even be cheaper to run processes in warmer climates. For example it is known that some processes, which need fermentation of the semi -solid products of waste water treatment need to be heated less or do not require insulation.

9 However, this may also lead to greater biological activity in waste water sewers causing septicity with the release of malodorous gases. These will create more problems with the management of sewers, pumping stations and treatment plants. The waste water will be less treatable, there will be more public nuisance problems and there will be increased corrosion of the assets.

Pollution

10 It is known that surface water bodies with higher temperatures will suffer more from pollution discharges. In addition, where water is used for cooling and discharged back into rivers, more constraint and efforts may have to be put on limiting the induced increase in temperature downstream.

Seasonal regime of snow melt rivers

11 The general increase of temperature may reduce the amount of snow and ice stored in winter and released in rivers in spring and summer. Moreover, the snow- and glacier-melt may intervene earlier in spring, thus changing the seasonal regimes of rivers. This may have effects at the scale of large rivers such as the Rhine.

CONSEQUENCES OF HYDROLOGIAL EXTREMES

12 Changes in rainfall patterns will lead to events as widely different as water scarcity and flash flooding. Where there are changes in rainfall, there will be several consequences which will engage water managers in design and operations.

Water Resources

13 At a time when there will more demands on water resources, there is the potential that less will be available, and water scarcity could become a major resource and environmental problem. The best recharge of water resources occurs with slow availability of water such as constant light rain or slow snow melt. High intensity rainfall particularly after a long dry period in which the permeability of soil is decreased leads to rapid run-off and poor recharge. So it is possible for a water utility and water regulator to be managing a water shortage and flood at the same time – which is a difficult media and political message. This could reduce the reliability of ground water resources, in particular, in future and may result in the need to construct more multipurpose surface water reservoirs. Existing reservoirs could become inadequate to meet demand as rainfall becomes more variable.

14 Changes in land use and land cover will occur as a result of climate change and these could further influence the availability of water resources. The EWA believe it will be important to consider how land use in a catchment can be modified to increase water availability, for instance by slowing down rapid runoff from high rainfall events and by encouraging water to infiltrate to groundwater bodies. Experience gained in climates with low and variable rainfall could be modified and adopted for use.

15 In some areas total rainfall or snow melt could reduce over a year and this will have consequences for water resource availability. So, water prudence in treatment, distribution and use will be essential, but this only delays the need for further action. Economically, it is likely that as an alternative or as a step before

the development of new water fresh water resources, techniques such as demand management, water recycling and water re-use will become more viable at both collective and individual levels.

16 The EWA is very much of the view that sea and brackish waters must be seen as the third part of water resources along with ground and surface waters. Desalination of at least brackish waters will become economically sustainable and in some places even desalination of sea water may be the solution, particularly in countries that begin to see a reduction in water availability. However, this is an energy intensive option and may contribute to climate change; therefore more effort is needed to reduce the power demand of this option and more fundamental research is required into improving the efficiency of desalination.

17 Regions which have not been water rich, have already had to face the economic and social consequences arising from this and will be in a position to share knowledge with regions facing the problem for the first time in future These new sources of water have often been rejected in water rich regions on the basis of cost or aesthetics – but thinking must change. For example Thames Water serving London UK wants to build a desalination plant but this has been rejected by the Mayor of London who has insisted on greater emphasis being placed on leakage control and demand management.

18 Use of grey and rain water within residential and commercial property for non-potable purposes is growing in some Member States and this can reduce demand for potable water considerably. Development of water quality standards for grey and rain water for these purposes would help development of this trend. The EWA considers that the technologies of water recovery from treated municipal waste water, grey and rain water from homes for all purposes need greater attention, in particular, there needs to be a long campaign to shape public perceptions on the potable uses of such recovered waters. At the moment is acceptable to used recovered water for uses such as power station cooling, but rarely for potable purposes unless the water is returned to a watercourse for a short distance before re-abstraction.

19 The EWA is of the opinion that the term municipal waste- water or sewage should no longer be used and it urges policy makers to adopt the term 'used water' and the concept of 'used water recovery'. Indeed in some countries, this more positive terminology is already employed.

Flooding

20 This is one of the most evident of the deleterious effects of climate change. The flooding can be coastal, fluvial, and pluvial. The EWA recognises that there is a difficult political message in persuading the residents of Northern Europe that drought and flooding will co-exist in water management strategies, but the residents of Southern Europe are well aware of this apparent paradox arising out of more erratic and extreme weather patterns.

21 Periods of rainfall can be so intense that the rainwater can overwhelm surface water and highway drainage systems. The phenomenon of flash flooding is becoming more a of major risk in Northern Europe and the design of drainage systems in more temperate regions will, with changing weather patterns, have to include climate change risk factors into systems design and knowledge transfer should be encouraged and supported from people working in areas already suffering from excessive storm waters. This calls for an integrated design of reticulated systems including retention, individual retention and infiltration measures, and urban design accounting for the "ways of water". Where networks and storm tanks cannot cope, or would be too expensive, the appropriate design of streets and squares can to some extent reduce city vulnerability and surface flow hazards.

22 Rainfall in a catchment can aggregate to be so excessive that it causes flooding in the lower catchment, particularly in low lying areas. So flood risk management is now a very important branch of water cycle management. Sometimes this requires building large civil engineering structures as in the River Thames for instance, where the presence of the Thames Barrier is essential for the protection of London from flooding due to increased storm water surges. However, management is also about making sure that all developments take place, where possible, on land with lower flood risk. Developments should also be designed so that they do not increase flood runoff and catchments should be managed to reduce flood response through sensitive land use.

23 There is also a need to develop awareness of flood issues among the public and develop customer friendly and robust flood warning systems, the use of 'soft' engineering techniques, such as the re-creation of wet-lands as flood water storage areas and the incorporation of flood protection and flood resilience features into the design of homes and highways which have to be constructed in flood risk areas.

24 The EWA is actively involved in these topics and the association is running the European Flood Risk Information Network to harness the synergy of experience and knowledge of experts throughout Europe. The two organisations urge all concerned to re-think the prevailing philosophy and to change the emphasis from flood protection to flood risk management.

25 In coastal areas, problems are further compounded by changes in sea level. Some coastal areas are slipping into the sea because of erosion or tilting of the land mass. However, rises in sea level, as a consequence of higher temperatures and the melting of ice caps, is already worsening the current situation; flood risk management in these areas must be extended to include marine factors. Some areas will be very expensive or almost impossible to protect and it will be necessary to consider the social consequences of allowing natural coastal realignment in such cases.

26 The EWA recognises that climate risk factors are already included in flood risk management but is of the opinion that they should be used more widely, both for the design of protection levels and for determining the possible failure of structures.

Sewerage Overflows

27 Municipal waste water is collected in sewers and delivered to treatment works. It is very difficult, even impossible, to stop infiltration of ground or storm water into the total sewer and drain reticulation systems, indeed some systems are designed to collect rainwater. Under these circumstances, there will be overflows on the sewer network and at the treatment works to decant off excess flows at times of storm. These flows may well be partially treated; the overflow settings are set to ensure that in all but exceptional events the municipal waste water is treated fully. However, increased rainfall, particularly a greater number of intense events, will mean that more municipal waste water will be discharged untreated from the overflows more frequently. There is no doubt that overflows can have serious hydraulic and quality effects on receiving waters. Even separate surface water sewers can contribute to flooding and overflows from these systems can be contaminated – say from highway drainage or cross-connections in domestic property.

28 The EWA recognises that one of the most traumatic aspects of flooding is the presence of municipal waste waters in the flood water and the EWA urges all designers to make sewerage systems to be as flood proof as possible where rain intensities are set to increase. The EWA is aware that the Commission is concerned about current problems of this aspect and supports any actions taken to reduce such pollution; however it is also mindful of the cost implications and urges the Commission to consider this aspect as part of a longer term strategy rather than taking immediate action.

29 Flood waters are a complex mix of excess environmental waters spilling over from rivers or from surface water sewers which are not big enough and the excess municipal used water diluted with rainfall run-off water and flooding may occur because surface water sewers are not able to cope with the receiving waters. The problem is that if the landscape is flooded, under more intense periods of rainfall, there is nowhere for municipal waste water to go and in worst case scenarios the flood water may even enter the sewer system and flush out sewage back into homes. There will need to be measures to reduce use and discharge volumes by the public during emergencies and there will need to be an appropriate information system in place. There will also be a need for the provision of increased storage in the reticulation and treatment system and use of suitable devices to enable this to happen. There will also need to be more real-time flow management systems in place.

30 Questions must be posed about Sustainable Sewerage Designs. Designers and regulators should now add a climate change factor to design calculations with the questions such as:

- What is the best for a new system – combined or separate? The balance of the answer for new developments may tip more towards the latter than it has in the past. However the EWA recognises that there are differences in attitudes to these two approaches between European Union States.

- What can be done on old systems to increase storage of the excess flows, so that they can be treated when the storm is finished?

- What can be done to improve the quality of excess flows?

31 The contribution of combined sewer overflows to environmental waters is also a very important issue which will also embrace the outrage of public perception in seeing pollution occur. The EWA supports the Commission in pursuing these aspects under the Water Framework Directive. It is discussed in more detail later.

Reticulation and Wastewater Treatment

32 Rainfall per se should not affect the design and capacities of treatment works. But the dangers posed by flood waters will create additional design and management strategies. Extra precautions must be included to defend electrical assets, boreholes and treatment plants during times of flooding. Furthermore, raw water resources may become contaminated or even damaged and contingency plans will be need to maintain wholesome potable supplies.

33 The changes in rainfall patterns and surface water volumes could influence the design capacities of sewer and wastewater treatment works in order to avoid foul water flooding as explained earlier. But lower flows and higher temperature will combine to change the volumes and character of the used water. In some locations with existing combined sewers, it will vary in one year from being low flows of strong and even septic quality with a tendency to deposit solids in sewers, through to very high flows of better quality. So this may well affect the treatability of sewages in such changed circumstances. Again the experiences of Southern Europe will be helpful – but even in those regions the variations may become more extreme and there may be a need for further changes in practice. So the retro-fitting of changes to a reticulation and or treatment system will need different approaches to the design of new systems.

34 A change in weather could even affect sewage sludge treatment and disposal. For example a warmer climate might mean that sludge digestion might be easier in itself but sludges may be less treatable. Equally the changes in farming practices might alter demands for the use of treated sludge as a fertiliser on farmland. Warmer weather might also change the public health profiles of communities leading to shifts in attitudes towards the sanitisation of sludges before use. All these are uncertain factors which need to be explored.

OTHER CONSEQUENCES FOR THE MANAGEMENT OF WATER IN THE ENVIRONMENT

35 So far this Opinion has been focussed on looking at changes in temperature and rainfall as separate issues but not only are these linked as meteorological factors, but the consequences are often linked together. For example, changes in irrigation practices and waste-water treatment plant design, but the combined effects will be observed most evidently in the natural environment.

36 Many of the members of the EWA work in the spheres of ecology and biodiversity. It is recognised that there are changes in the natural environment, for example wildflowers are flowering earlier or later than usual or they are disappearing from habitats and appearing elsewhere. Insects and birds are changing in distribution as well. Species are appearing in Northern Europe which have been restricted to Southern Europe. These changes are evident in the aquatic environment where for example, the chard, an artic fish, has remnant colonies in Northern England lasting from the last Ice age, but it is under threat of extinction due to higher water temperatures

37 The abatement of higher water temperatures is difficult and can only be achieved with such measures as the introduction of colder ground water. This is usually not a practical option due to resource availability and quality. Ground water sources where available, may be used to artificially to recharge drying wetlands.

38 Higher temperatures will allow foreign species from warmer climes introduced by accident or design to flourish to the detriment of local ecologies. For example in the UK , terrapins from America have been released and these are very aggressive to local species, but they do not breed due to lower water temperatures – but that could change.

39 The EWA urges environmental and trade regulators to restrict trade movements of exotic species not only as good current practice but as a contribution to the mitigation of the effects of climate change

40 Higher temperatures and dry conditions may lead to a break down of soil structure and an increased dust burden in the atmosphere. This may be exacerbated by faming practices which are not environmentally friendly, as happened during the drought in the early Twentieth Century in Central USA. Loose soils are washed easily into water bodies at times of intense rainfall. So one effect of climate change in some areas will be increased sediment burden in environmental waters with consequences for water quality and wildlife. It will increase the costs of reservoir and surface water treatment management.

41 The EWA recommends that more ways be found to stabilise soils, good examples are the recycling of bio-solids to land and the planting of protective bands of trees and hedges alongside water courses. Where this is not possible, farming methods should be practiced which cause the least disruption of soils and prevent sediment from running off, such as contour ploughing, injection of agrochemicals, arable exclusion or low intensity farming practice zones alongside water courses and of course, avoiding deforestation where-ever possible. These practices will also improve moisture retention and encourage infiltration, lessening the impacts of increased rainfall variability.

42 Changes in climate will also influence soil chemistry and microbiology with consequent changes in run off quality. Furthermore, it may also result in changes in the use of fertilisers and other agrochemicals such as herbicides and pesticides. This will influence the aquatic ecosystem detrimentally and once again will increase the costs of treating surface water for potable purposes. Where the agrochemicals also penetrate into groundwater, exacerbating problems which occur now, these waters will also require more treatment and will be more expensive to use.

43 The EWA supports the continuing effort in research to develop more environmentally friendly chemicals and farming practices and to the development of more robust strains of crops able to withstand climatic changes.

CONSEQUENCES OF CLIMATE CHANGE ON LONG TERM DECISIONS

44 Climate and its impacts will go on changing over the long lifetime of water-related assets: multipurpose dams, dikes, tanks, civil engineering structures of treatment facilities, but also protection assets against natural mountainous hazards (mud flows…) including protective vegetation. Furthermore, these assets are to face not only climate change, but also demographic changes (population increase and migrations), economic changes, land use pattern changes…

45 Long term investment decisions are therefore to consider significant future changes over time (both general trends and evolutions in probability laws of random events), with a high uncertainty. The design of long life assets has also to consider the needs for adaptability and modularity.

46 On the other hand, decentralized and semi-decentralized options (small loops, recycling at various scales) will gain in importance as an alternative to increasing the capacity of existing reticulated systems. This requires an assessment of the sustainability of options where the mix of centralized assets and decentralized equipment evolves over time.

EU Policy and Funding

47 It is also essential given all the potential impacts outlined in this opinion that the effects of climate change are taken into account when developing new directives or revising existing legislation. Indeed, for some pieces of legislation, it may be necessary to provide supplementary guidance on climate change. Equally, the EU funding streams such as Cohesion for EU members and ISPA for the pre–accession countries must have the project assessment criteria reviewed to take account of the impact of climate change and projects submitted must be designed accordingly.

48. The EWA recognises that the EU and national governments are sponsoring a lot of research in the climate change area, including that related to water management. It is therefore vital that the academic, policy and user communities interact closely. It is also important that the various technical platforms such as the Water Supply and Sanitation Technology Platform (WSSTP) and other platforms established under the Environmental Technology Action Plan should be encouraged to incorporate climate change within their core objectives. The EWA is prepared to input into these programmes as appropriate

CONCLUSIONS

49 From the evidence available it is clear that climate risk factors now have to be built into water cycle management henceforth. Funds should be available to support the practical consequences of this. The EWA recognises the breadth and complexity of the topic. When investment is needed, greater clarity is needed in terms of the risks of climate change so that planners, investors and all those working in the sector can better plan for the effects of climate change.

50 It is equally important that the European Union reviews it funding support for research and capital projects, ensuring that climate change is a factor in project evaluation and is a core component of the relevant research projects and technology platforms.

51 The purpose of the Preliminary Opinion is to set the scene. The EWA will be pursuing this and offers its support and contribution to the Commission. Every three years the EWA organises a major conference at the IFAT in Munich and the next one is in April 2008. The EWA intends that this topic will be included in the conference. It intends that the co-organisers will be the Water Environment Federation of the US and the Japan Sewerage Works Association (JWSA). It will also draw on information developed through national work and conferences organised by National Members. Hence the EWA offers to harmonise its work programme with that of the Commission and the German Presidency.

EWA, Hennef, September 2006

ANNEX I

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European Water Association

The European Water Association (EWA) is an independent non-governmental and non-profit making organisation dealing with the management and improvement of the water environment. It was founded on 22 June 1981 as the European Water Pollution Control Association. The scope of the Association was enlarged in 1999 with the change of name to the European Water Association.

It is one of the major professional associations in Europe that covers the whole water sector, wastewater as well as drinking water and water related waste. With member associations from nearly all European countries EWA consists of most European Union Member States, including all countries from Central and Eastern Europe which joined the European Union on 1 May 2004. Other European countries represented within the EWA are Croatia, Romania, Ukraine, Serbia and Montenegro, Norway, and Switzerland.

The aim of EWA is to provide a forum for the discussion of key technical and policy issues affecting the growing European region. This is done through conferences, workshops, meetings and special working groups of experts all organised on an international basis together with regular publications.

EWA informs its members on the development of EU legislation and standardisation and seeks to influence the drafting when appropriate. It has close contacts with the European Commission (DG Environment), the European Committee for Standardization (CEN), the European Environment Agency (EEA) and the European Parliament.

Through this exchange of knowledge the objective of EWA is to contribute to sustainable water management, a safe water supply and the protection of the water environment.

Today, EWA consists today of about 25 European national associations each representing professionals and technicians for wastewater and water utilities, academics, consultants and contractors as well as a growing number of corporate member firms and enterprises. EWA thus represents about 55,000 professional individuals working in the broad field of water management.

Our vision

As a major and influential European organisation representing water professionals through their National Associations, EWA promotes the sustainable management of the total water cycle for Society's needs coupled with excellent service provided by informed and expert people.

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